Issue: Relative Potential Benefit to Air Quality from Forests and Canopy

The intent of this issue is to:

- Identify are the areas of greatest need with respect to air quality and where forests can have the greatest benefit.

Discussion: Air quality is both impacted by and benefited from forests. Wildfires—especially large uncharacteristic ones—pump a great deal of particulates (from smoke) and carbon into the air. Communities within the air sheds of these fires suffer poorer air quality and commensurate health impacts. Certain tree species are also net producers of biogenic volatile organic compounds (BVOC's), which can exacerbate ozone production, especially in urban areas. However, forest canopy can also absorb and filter particulates and pollutants out of the air, improving air quality. Likewise, trees sequester carbon and release oxygen—important for mitigating climate change and for human and animal health. Since temperature is a catalyst for production of volatile organic compounds (VOC's), the cooling effect of tree canopy in urban areas can lower their production. Sources of VOC's include any petroleum product that breaks down (asphalt, plastics, etc.) and parked vehicles (evaporation of fuel in gas tanks). By also cooling buildings and thereby lowering energy use, urban tree canopy can also reduce energy production. If this energy is from fossil fuels, this results in additional emissions reductions, including carbon.

It makes good sense to manage forests within urban air sheds to increase forest health and fire resiliency, thereby reducing negative impacts on public health. Likewise, increasing canopy cover and forest management within these areas also has a positive public health impact by helping reduce the causes of pollution while filtering out other pollutants and particulates.

Data used:

There were three principle datasets used in this analysis.

1. **Non-attainment zones**.

   Non-attainment areas were obtained from the Idaho Department of Environmental Quality. These are areas within Idaho where air pollution levels persistently exceed the national ambient air quality standards (NAAQS), designated "nonattainment." EPA considers any geographic area that meets or has pollutant levels below the NAAQS an attainment area. Under ideal circumstances, all of Idaho would be classified as "attainment." Areas with persistent high pollutant levels are designated as nonattainment areas, meaning these areas have violated federal health-based standards

for outdoor air pollution. Each nonattainment area is declared for a specific pollutant, meaning the same area could be "attainment" for one pollutant, but "nonattainment" for a different pollutant. Nonattainment areas for different pollutants may overlap each other or share common boundaries.

This layer was used to select all subwatersheds (Hydrologic Unit Code—or HUC—6th level) that contained non-attainment areas. Subwatersheds that contained a non-attainment area were given a value of 5 and Subwatersheds that did not contain a non-attainment area were given a value of 0.

2. **Smoke impact zones**
   These data were provided by the Idaho/Montana Airshed Group http://www.smokemu.org/index.php. Air Impact Zones are areas where smoke from wildfires is likely to be a problem because of local topography, meteorology, and areas with existing air quality problems that smoke from wildfires will exacerbate, or other factors. Increasing canopy in these areas will help mitigate the impacts of particulates from smoke, improving air quality and public health.

3. **Canopy cover relative to impervious surfaces**
   Data used were two products of the National Land Cover Dataset (NLCD) 2001—Impervious surfaces and Tree Canopy. These data were produced through a cooperative project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium, a partnership of federal agencies (see www.mrlc.gov). For a detailed definition and discussion on MRLC and the NLCD 2001 products, refer to http://www.mrlc.gov/mrlc2k.asp.

   As noted in the issue discussion above, impervious surfaces have a negative impact on air quality for a variety of reasons. Research has demonstrated the significant positive impact of tree cover in such areas by filtering particulates, absorbing CO2 and other pollutants, and lowering ambient air temperature while reducing the impact of ultraviolet radiation. With these data, we are identifying areas that have a high percentage of impervious surfaces, but lack significant canopy cover in the surrounding area. Indentified, then, are areas where additional canopy can have a substantial impact in mitigating poorer air quality to which impervious surfaces contribute.

The NLCD_2001_impervious layer was classified on the percent imperviousness value by natural breaks into 5 classes and weighted as follows:

Class	% Impervious	Weight
0	0 – 6	0
1	7 – 17	1
2	18 – 30	2
3	31 – 46	3
4	47 – 65	4
5	66 – 100	5

The NLCD_2001_canopy layer was classified on the percent canopy cover value. A neighborhood mean canopy cover was created from the canopy cover data by taking the mean value of the 25 (5 by 5) neighboring cells for every cell. The mean canopy cover value is a measure of the canopy cover surrounding impervious areas. The mean canopy cover was grouped by natural breaks into 5 classes and weighted as follows:

Class	Mean % Canopy	Weight
1	0 – 17.431	0
2	17.432 – 38.349	1
3	38.50 – 59.267	1
4	59.268 – 78.690	2
5	78.691 – 100	3

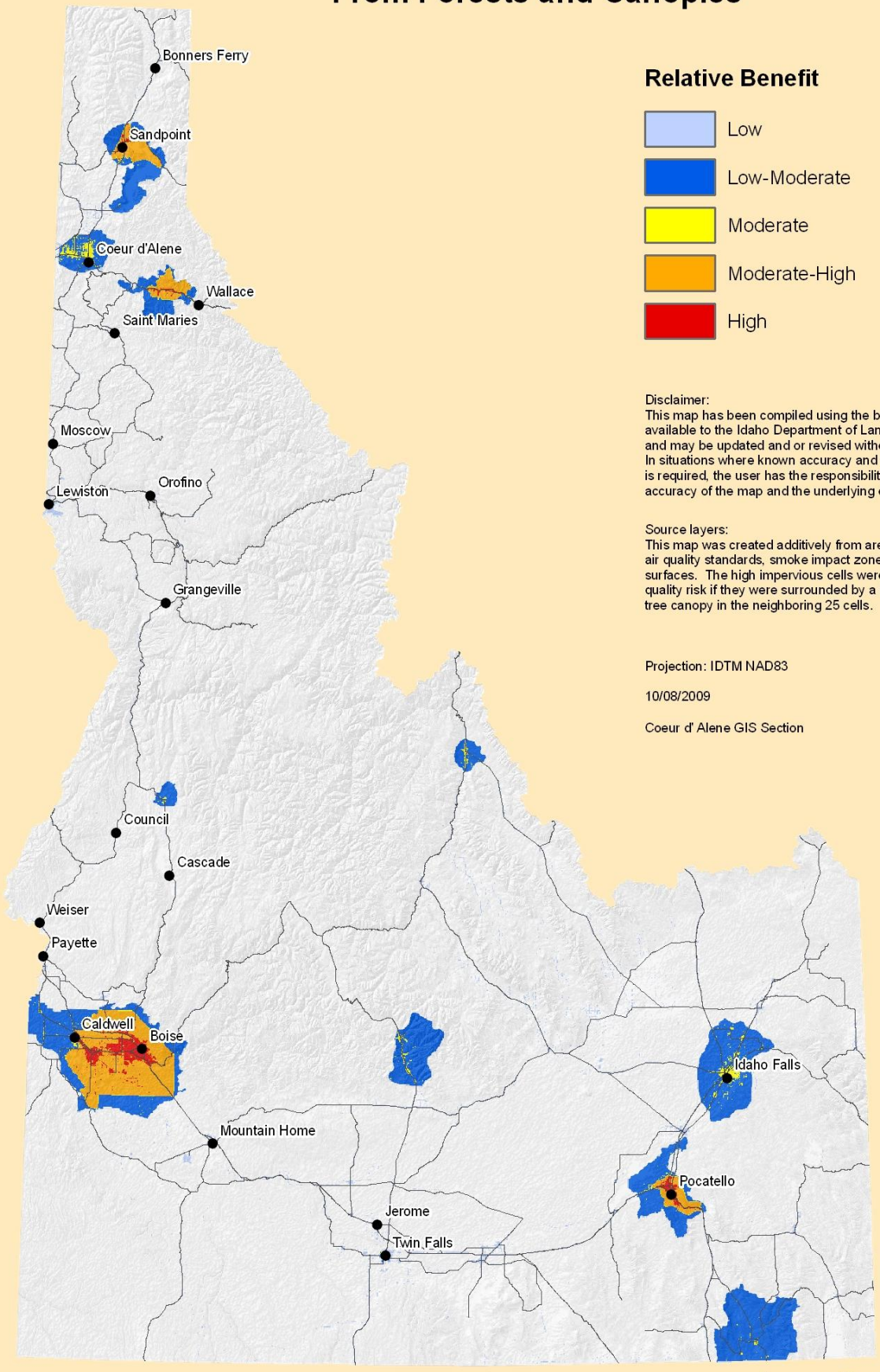
Then, the Impervious surface weight was lowered by the mean percent canopy cover weight.

Issue Process: The map is created additively from areas that did not attain air quality standards, are within smoke impact zones, and have a high percentage of impervious surfaces with low percentages of surrounding canopy cover. The additive result was reclassified into 5 classes based natural breaks giving resulting values of 0 – 5.

Data Considered, but not used:

Data on above-ground dry biomass was considered for this issue, as it can be used as a surrogate for carbon sinking. However, the Core Guidance Team determined not to use it for this issue, feeling it was more of an economic issue than one of air quality. As noted above, within this issue, we are trying to locate the areas in which increased canopy could have a relatively high potential for improving poor air quality.

Relative Potential Benefit to Air Quality From Forests and Canopies



Relative Benefit

- Low
- Low-Moderate
- Moderate
- Moderate-High
- High

Disclaimer:
This map has been compiled using the best information available to the Idaho Department of Lands at the time and may be updated and or revised without notice.
In situations where known accuracy and completeness is required, the user has the responsibility to verify the accuracy of the map and the underlying data sources.

Source layers:
This map was created additively from areas that did not attain air quality standards, smoke impact zones, and impervious surfaces. The high impervious cells were lowered in air quality risk if they were surrounded by a high percent of tree canopy in the neighboring 25 cells.

Projection: IDTM NAD83

10/08/2009

Coeur d' Alene GIS Section

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